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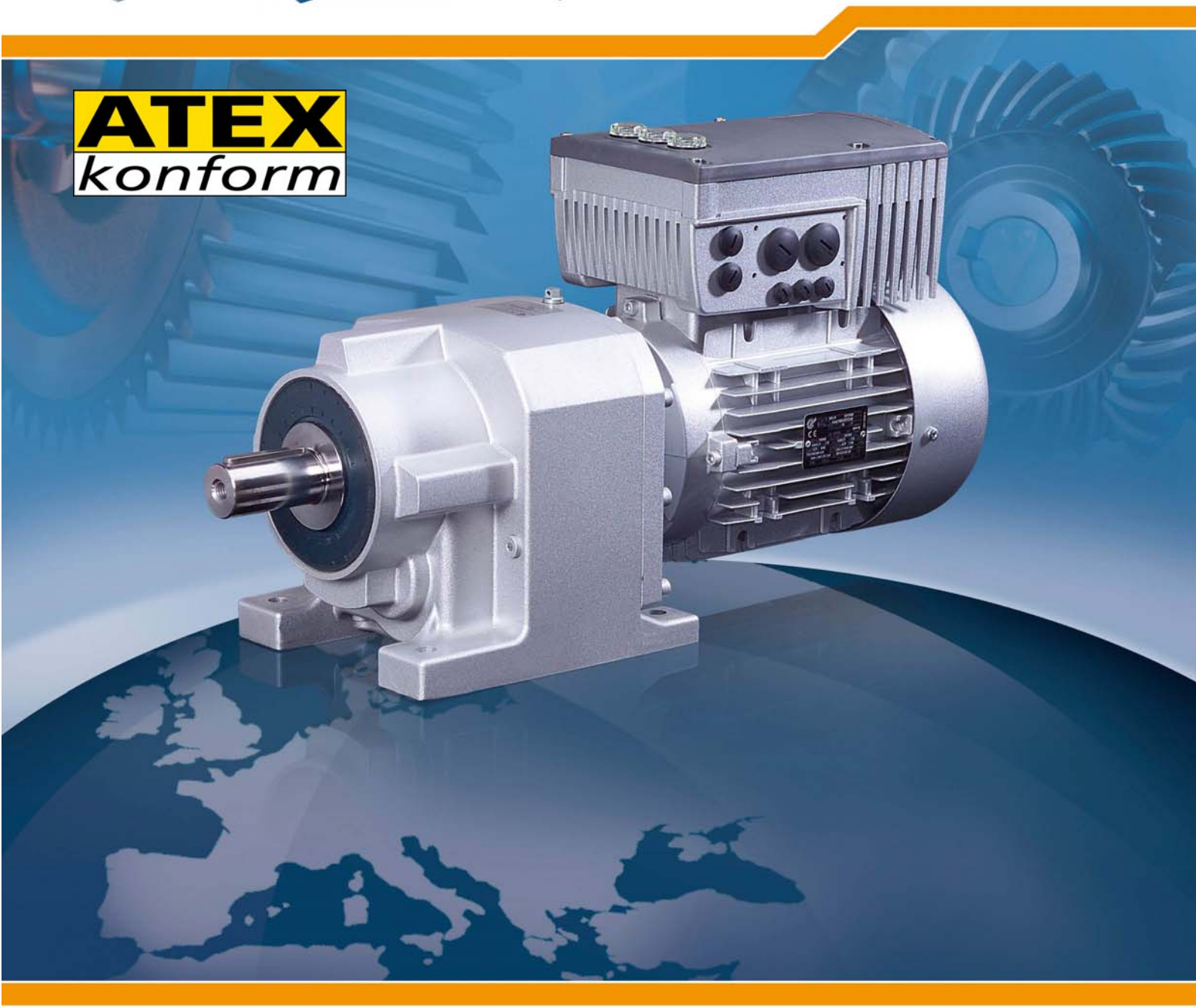

GB

BU 0240

NORDAC SK 200E

Brief instructions for frequency inverters

NORD DRIVESYSTEMS

N O R D A C SK 200E frequency inverters

Safety and operating instructions for drive power converters

(as per: Low Voltage Directive 2006/95/EEC)

1. General

During operation, drive power converters may, depending on their protection class, have live, bare, moving or rotating parts or hot surfaces.

Unauthorised removal of covers, improper use, incorrect installation or operation causes a risk of serious personal injury or material damage.

Further information can be found in this documentation.

All transportation, installation, initialisation and maintenance work must be carried out by **qualified personnel** (compliant with IEC 364, CENELEC HD 384, DIN VDE 0100, IEC 664 or DIN VDE 0110, and national accident prevention regulations).

For the purposes of these basic safety instructions, qualified personnel are persons who are familiar with the assembly, installation, commissioning and operation of this product and who have the relevant qualifications for their work.

2. Proper use in Europe

Drive power converters are components intended for installation in electrical systems or machines.

When installed in machines, the drive power converter cannot be commissioned (i.e. commencement of the proper use) until it has been ensured that the machine meets the provisions of the EC Directive 2006/42/EEC (machine directive); EN 60204 must also be complied with.

Commissioning (i.e. implementation of the proper use) is only permitted when the EMC directive (2004/108/EEC) is complied with.

CE-labelled drive power converters meet the requirements of the Low Voltage Directive 2006/95/EEC. The harmonised standards for drive power converters listed in the declaration of conformity are used.

Technical data and information for connection conditions can be found on the rating plate and in the documentation, and must be complied with.

The drive power converters may only be used for safety functions which are described and explicitly approved.

3. Transport, storage

Information regarding transport, storage and correct handling must be complied with.

4. Installation

The installation and cooling of the equipment must be implemented according to the regulations in the corresponding documentation.

The drive power converter must be protected against impermissible loads. Especially during transport and handling, components must not be deformed and/or insulation distances must not be changed. Touching of electronic components and contacts must be avoided.

Drive power converters have electrostatically sensitive components, which can be easily damaged by incorrect handling. Electrical components must not be mechanically damaged or destroyed (this may cause a health hazard!).

5. Electrical connection

When working on live drive power converters, the applicable national accident prevention regulations must be complied with (e.g. VBG A3, formerly VBG 4).

The electrical installation must be implemented according to the applicable regulations (e.g. cable cross-section, fuses, ground lead connections). Further instructions can be found in the documentation.

Information about EMC-compliant installation – such as shielding, earthing, location of filters and installation of cables can be found in the drive power converter documentation. These instructions must be complied with even with CE marked drive power converters. Compliance with the limiting values specified in the EMC regulations is the responsibility of the manufacturer of the system or machine.

6. Operation

Where necessary, systems where drive power converters are installed must be equipped with additional monitoring and protective equipment according to the applicable safety requirements, e.g. legislation concerning technical equipment, accident prevention regulations, etc.

The parameterisation and configuration of the drive power converter must be selected so that no hazards can occur.

All covers must be kept closed during operation.

7. Maintenance and repairs

After the drive power converter is disconnected from the power supply, live equipment components and power connections should not be touched immediately, because of possible charged capacitors. Observe the applicable information signs located on the drive power converter.

Further information can be found in this documentation.

These safety instructions must be kept in a safe place!

Intended use of the frequency inverter

Compliance with the operating instructions is **necessary for fault-free operation** and the acceptance of possible warranty claims. **These operating instructions must be read** before working with the device!

These operating instructions contain **important information about servicing**. They must therefore be kept **close to the device**.

SK 200E frequency inverters are devices for industrial and commercial plants for operating three-phase asynchronous motors with squirrel-cage rotors. These motors must be suitable for operation with frequency inverters. Other loads must not be connected to the devices.

SK 200E frequency inverters are devices for fixed installation on motors or in the vicinity of the motors to be operated. All details regarding technical data and permissible conditions at the installation site must be complied with.

Commissioning (implementation of the intended use) is not permitted until it has been ensured that the machine complies with the EMC directive 2004/108/EEC and that the conformity of the end product meets the machine directive 2006/42/EEC (note EN 60204).

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Documentation

Designation:	BU 0240 GB
Part No.:	607 24 02
Device series:	SK 205E, SK 215E, SK 225E, SK 235E
Device types:	**SK 2xxE-250-112-O ... SK 2xxE-750-112-O,** 0.25 - 0.75kW, 1~ 100-120V, 230V Output
	SK 2xxE-250-123-O ... SK 2xxE-111-123-A, 0.25 - 1.1kW, 1~ 220-240V
	SK 2xxE-250-323-O ... SK 2xxE-401-323-A, 0.25 - 4.0kW, 3~ 220-240V
	SK 2xxE-550-340-O ... SK 2xxE-751-340-A, 0.55 - 7.5kW, 3~ 380-500V

Version list

Designation of previous versions	Software Version	Comments
BU 0240 GB, June 2010 Part No. 607 2401 / 2210	V 1.2 R0	First version based on BU 0200 DE / 1310

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Standards and approvals

All devices of the entire SK 200E series comply with the standards and directives listed below. For detailed information, please refer to the main manual BU0200.

Standard / Directive	Logo	Comments
EMC	CE	EN 61800-3
UL	UL LISTED	File No. E171342
cUL	c UL us LISTED IND. CONT. EQ. 8D56	File No. E171342
C-Tick		N 23134
RoHS	RoHS-conform 2002/95/EC	2002/95/EU RoHS compliant

NOTE

These brief instructions only contain a limited amount of information. For a detailed description of use and the technical details of the SK 200E and its options, please refer to the main document BU0200.

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1 General information

These brief instructions for the SK 200E are based on the user manual for the frequency inverter - BU0200.

In addition to information concerning safety and use, this document also contains selected information on commissioning, as well as use of the frequency inverter in explosion hazard areas (ATEX Zone 22).

This manual is based on the device software V1.2 R0 (see P707) of the SK 200E. If the frequency inverter uses a different software version, this may cause differences.

A detailed description of the SK 200E and its options can be found in the user manual (BU0200). This and other documents can be downloaded free of charge from www.nord.com.

1.1 Delivery

Check the equipment **immediately** after delivery/unpacking for transport damage such as deformation or loose parts.

If there is any damage, contact the carrier immediately and carry out a thorough assessment.

Important! This also applies even if the packaging is undamaged.

1.2 Safety and installation information

NORDAC SK 200E frequency inverters are devices for use in industrial high voltage systems and are operated at voltages that could lead to severe injuries or death if they are touched.

- Installation and other work may only be carried out by qualified electricians and with the device disconnected. The operating instructions must always be available to these persons and must be strictly observed.
- Local regulations for the installation of electrical equipment and accident prevention must be complied with.
- The equipment continues to carry hazardous voltages for up to 5 minutes after being switched off at the mains.
- For single phase operation (115/230V) the mains impedance must be at least 100µH for each conductor. If this is not the case, a mains choke must be installed.
- For safe isolation from the mains, all poles of the supply cable to the frequency inverter must be able to be disconnected.

- Even during motor standstill (e.g. caused by a release block, blocked drive or output terminal short circuit), the line connection terminals, motor terminals and braking resistor terminals may still conduct hazardous voltages. A motor standstill is not identical to electrical isolation from the mains.

- **Warning**: with certain settings, the frequency inverter/motor can start up automatically after the mains are switched on.
- The frequency inverter is only intended for permanent connection and may not be operated without effective earthing connections which comply with the local regulations for large leakage currents (> 3.5mA). VDE 0160 stipulates the installation of a second earthing conductor or an earthing conductor cross-section of at least 10 mm^2.
- Normal **FI-circuit breakers** are not suitable as the sole protection for three-phase frequency inverters if the local regulations do not permit a possible DC proportion in the fault current. According to EN 50178 / VDE 0160, the FI circuit breaker must be an all-current sensitive FI circuit breaker (type B).
- In normal use, NORDAC SK 200E frequency inverters are maintenance free. The cooling surfaces must be regularly cleaned with compressed air if the ambient air is dusty.

CAUTION

The heat sink and all other metal components can heat up to temperatures above 70°C.

When mounting, sufficient distance from neighbouring components must be maintained. When working on the components, allow sufficient cooling time beforehand

Protection against accidental contact may need to be provided.

ATTENTION

DANGER TO LIFE!

The power unit can continue to carry voltages for up to 5 minutes after being switched off at the mains. Inverter terminals, motor cables and motor terminals may carry voltage!

Touching open or free terminals, cables and equipment components can lead to severe injury or death!

Work may only be carried out by qualified specialist electricians and with the electrical supply to the equipment disconnected!

CAUTION

Children and the general public must be kept away from the equipment!

The equipment may only be used for the purpose intended by the manufacturer. Unauthorised modifications and the use of spare parts and additional equipment which has not been purchased from or recommended by the manufacturer of the device may cause fire, electric shock and injury.

Keep these operating instructions in an accessible location and give them to all operators!

WARNING

This product intended for use in an industrial environment and is subject to sales restrictions according to IEC 61800-3. In a domestic environment, this product can cause high frequency interference, in which case the user may be required to take appropriate measures.

An appropriate measure would be the inclusion of a recommended mains filter.

1.3 Wiring guidelines

The frequency inverter has been developed for use in an industrial environment. In this environment, high levels of electromagnetic interference can influence the frequency inverter. In general, correct installation ensures safe and problem-free operation. To meet the limiting values of the EMC directives, the following instructions should be complied with.

(1) Ensure that all equipment in the control cabinet is securely earthed using short earthing cables which have large cross-sections and are connected to a common earthing point or earthing bar. It is especially important that all control devices connected to the frequency inverters (e.g. an automation device) are connected to the same earthing point as the inverter itself, using a short cable with large cross-section. Flat conductors (e.g. metal clamps) are preferable, as they have a lower impedance at high frequencies.

(2) The bonding cable of the motor controlled by the frequency inverter should be connected directly to the earthing terminal of the associated frequency inverter. The presence of a central earthing bar in the control cabinet and the grouping together of all bonding conductors to this bar normally ensures safe operation.

(3) Where possible, shielded cables should be used for control loops. The shielding at the cable end should be carefully sealed and it must be ensured that the wires are not laid over longer distances without shielding.

The shields of analog setpoint cables should only be earthed on one side on the frequency inverter.

(4) The control cables should be installed as far as possible from power cables, using separate cable ducts, etc. Where cables cross, an angle of 90° should be ensured as far as possible.

(5) Ensure that the contactors and brake chokes in the cabinet are interference protected, either by RC circuits in the case of AC contactors, or by “free-wheeling” diodes for DC contactors, for which **the interference protectors must be positioned on the contactor coils**. Varistors for over-voltage limitation are also effective. This interference suppression is particularly important when the contactors are controlled by the relay in the frequency inverter.

(6) Use screened or armoured cable for the load connections (motor cable) and earth the screening/armour at both ends, if possible to the frequency inverter bonding.

In addition, an *EMC-compliant cabling* must be ensured.

The safety regulations must be complied with under all circumstances when installing the frequency inverter!

NOTE

The control cables, line cables and motor cables must be laid separately. In no case should they be laid in the same protective pipes/installation ducts.

The test for high voltage insulations must not be used on cables which are connected to the frequency inverter.

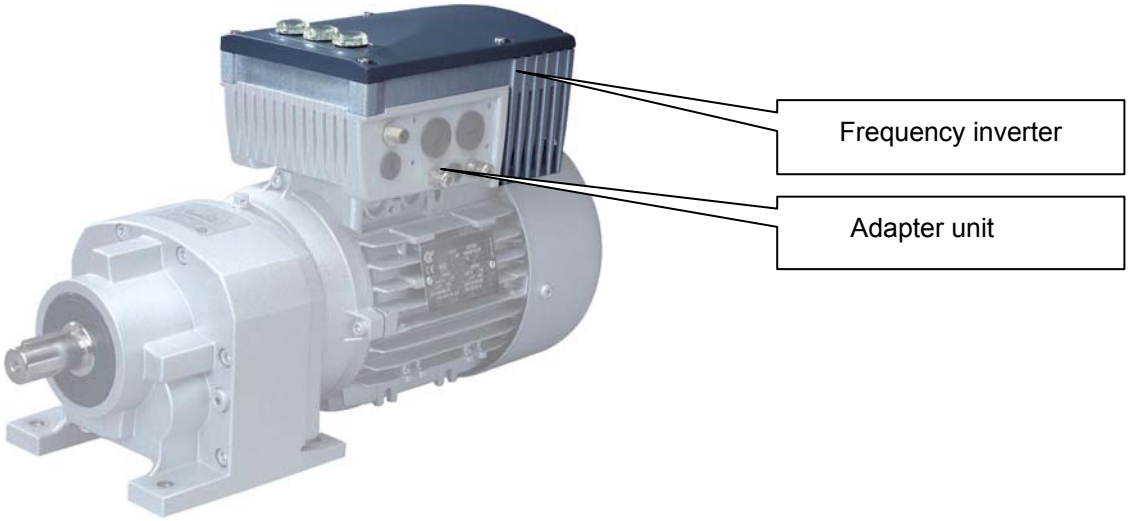
ATTENTION

With the use of a ParameterBox SK PAR-3H this must never be simultaneously connected to the frequency inverter and the PC, as potential shifts may cause damage, especially to the PC. (See also Manual BU0040)

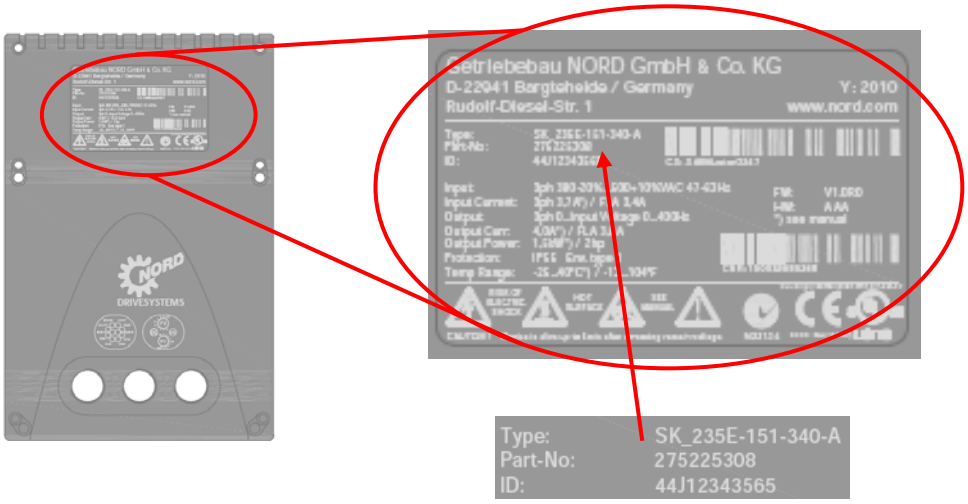
1.4 Nomenclature / type codes

Unique type codes have been defined for the individual modules and devices. These provide individual details of the device type and its electrical data, protection class, fixing version and special versions. A differentiation is made according to the following groups:

Group	Example of type code
Frequency inverter - basic device	SK 205E-550-323-A (-C)
Adapter unit - frequency inverter	SK TI4-1-205-1 (-C-WMK-1)
Connection unit - Technology Unit	SK TI4-TU-BUS (-C-WMK-TU)
Optional modules	SK TU4-CAO (-C-M12)
Extension modules	SK TIE4-M12-CAO

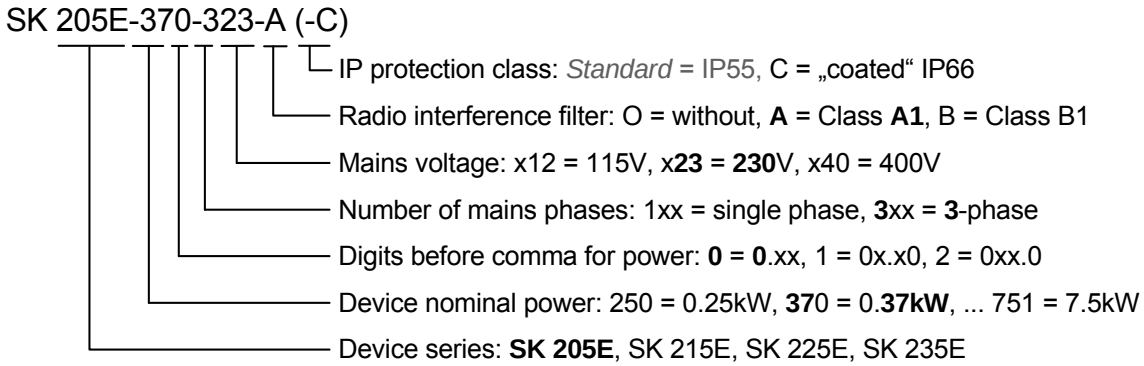


The type designation resulting from this type code can be obtained from the rating plate which is attached to or printed on the relevant module.



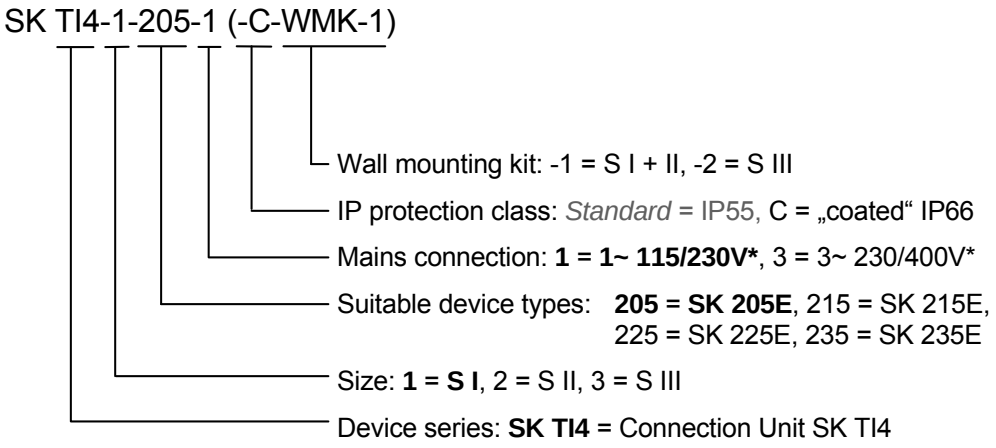
Example: Frequency inverter rating plate

Frequency inverter type code


SK 205E-370-323-A (-C)
IP protection class: Standard = IP55, C = „coated“ IP66
Radio interference filter: O = without, A = Class A1, B = Class B1
Mains voltage: x12 = 115V, x23 = 230V, x40 = 400V
Number of mains phases: 1xx = single phase, 3xx = 3-phase
Digits before comma for power: 0 = 0.xx, 1 = 0x.x0, 2 = 0xx.0
Device nominal power: 250 = 0.25kW, 370 = 0.37kW, ... 751 = 7.5kW
Device series: SK 205E, SK 215E, SK 225E, SK 235E

(...) Options, only implemented if required.

Adapter Unit type code


SK TI4-1-205-1 (-C-WMK-1)
Wall mounting kit: -1 = S I + II, -2 = S III
IP protection class: Standard = IP55, C = „coated“ IP66
Mains connection: 1 = 1~ 115/230V*, 3 = 3~ 230/400V*
Suitable device types: 205 = SK 205E, 215 = SK 215E, 225 = SK 225E, 235 = SK 235E
Size: 1 = S I, 2 = S II, 3 = S III
Device series: SK TI4 = Connection Unit SK TI4

*) The voltage depends on the frequency inverter used; please also refer to the technical data.

(...) Options, only implemented if required.

The description of the type codes for the options can be found in BU0200.

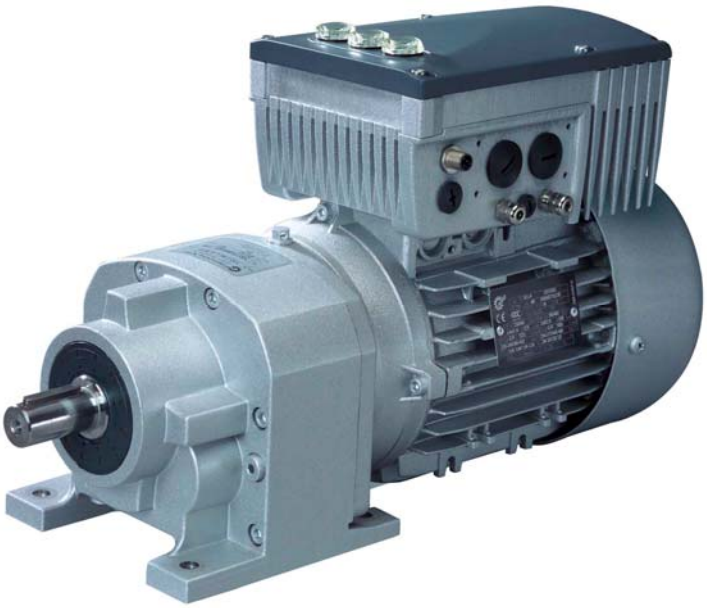
2 Assembly and installation

2.1 Installation and assembly

NORDAC SK 200E frequency inverters are available in various sizes depending on their output. Connection of the SK 200E to the motor or the wall-mounting unit is made by means of the a suitable size of connection unit SK T14-… The frequency inverter is mounted by means of integrated plug contacts.

The devices require adequate ventilation to protect against overheating.

Motor-mounted version: Here, the ventilation of the motor is integrated into the cooling concept of the FI. Mounting must therefore always be carried out as shown in the illustration. For permanently low motor speeds and self-ventilated motors, a reduction in power similar to the wall-mounted version must be taken into account.



Wall-mounted version: In continuous operation (S1), mounting away from the motor causes a reduction in the power of the FI by one power level. This means that relative to the motor, the FU must be selected one power level larger.

NOTE

For further details of the power reduction and the possible ambient temperatures, please refer to the technical data in BU0200

Mounting the adapter unit

For the supply of a *complete* drive unit (gear unit + motor + frequency inverter) the SK 200E frequency inverter and the SK T14-... adapter unit are always completely assembled and tested. The adapter unit can also be ordered separately for subsequent mounting on an existing motor or to replace a different motor-mounted frequency inverter.

NOTE

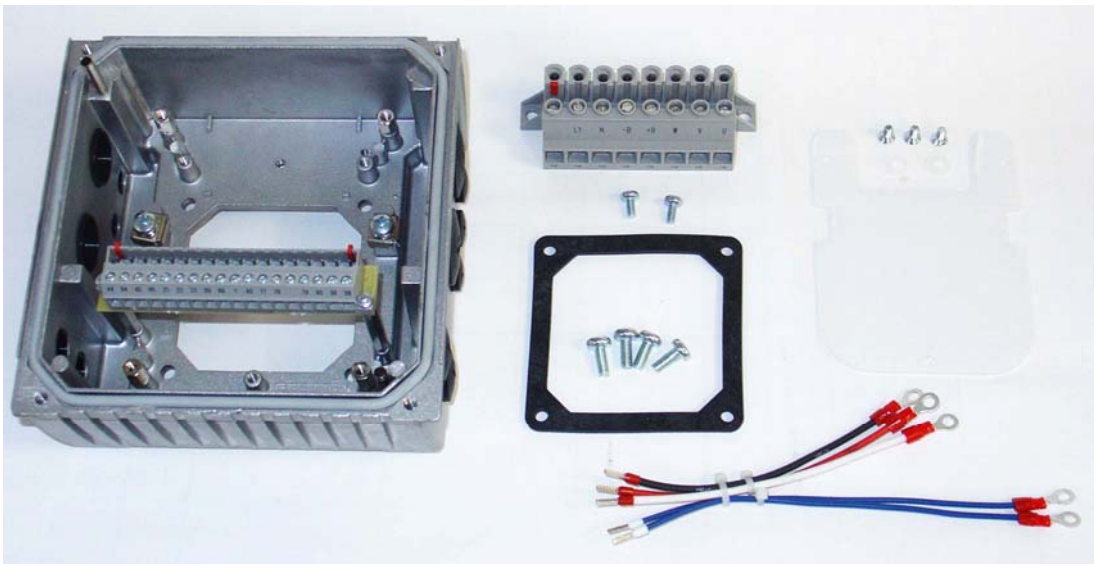
However, the IP66 compliant SK 200E must be installed by NORD, as special measures must be implemented. IP66 components retrofitted on site cannot ensure that this protection class is guaranteed.

The “Adapter unit SK T14” includes the following components:

- Cast housing, seal (already glued in) and insulation plate
- Power terminal block, corresponding mains connection
- Control terminal block, corresponding SK 200E version
- Screw kit, for mounting on the motor and the terminal bars
- Pre-fabricated cable for motor and PTC connections

Procedures:

1. If necessary, remove the original terminal box from the NORD motor, so that only the base of the terminal box and the terminal strip remain.
2. Set the bridges for the correct motor circuit and connect the pre-fabricated cables for motor and PTC connections to the respective connection points on the motor.
3. Mount the cast housing on the terminal box base using the existing screws and seal. Position the cast housing with the dome facing the A-side of the motor. Check the adaptability for different motor manufacturers.
4. Attach the insulating plate above the terminal strip. Screw on the power terminal block above this using the 2 M4x8 screws and the plastic washers.
5. Connect the motor cables U, V, W to the power terminal block and the PTC cable TF+, TF- to the control terminal block 38, 39.



2.2 Electrical connection

WARNING THE DEVICES MUST BE EARTHED.

Safe operation of the devices requires that is installed and commissioned by qualified personnel in compliance with the instructions provided in this Manual.

In particular, the general and regional installation and safety regulations for work on high voltage systems (e.g. VDE) must be complied with as must the regulations concerning correct use of tools and the use of personal protection equipment.

Dangerous voltages can be present at the motor connection terminals even when the inverter is switched off. Always use insulated screwdrivers on these terminal fields.

Ensure that the input voltage source is not live before setting up or changing connections to the unit.

Make sure that the inverter and motor are specified for the correct supply voltage.

In order to access the electrical connections, the SK 200E must be removed from the SK T14 connection unit. Proceed as follows:

1. Switch off the mains supply and if necessary check and observe the waiting period.
2. Loosen the 4 Allen screws (4mm).
3. Carefully lift the FI vertically off the connection unit.
4. The electrical connections and the option slots are now freely accessible.

To replace the FI, proceed in the opposite sequence:

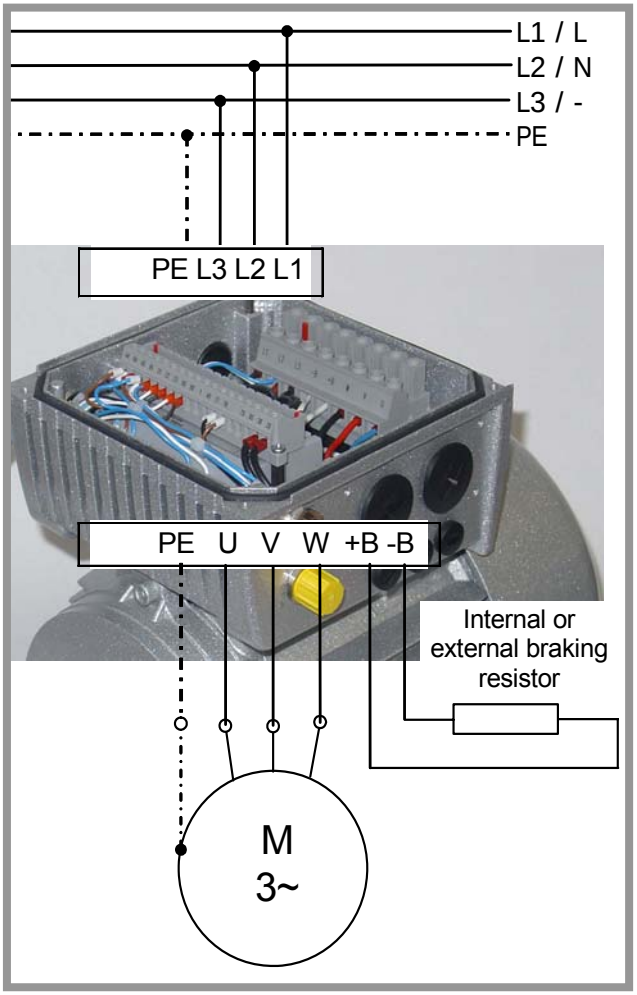
5. Here, special care must be taken that the PE pins are correctly contacted.
   These are located diagonally in 2 corners of the FI and the connection unit.
6. The FI can only be placed on the SK T14 in one orientation.
7. Evenly tighten the Allen screws in a cross-wise direction.

2.3 Electrical connection of power unit

All connection terminals are located in the connection unit of the frequency inverter.

One terminal block is provided for the power connections and one for the control connections.

The earthing connections (device earthing) are located on the base in the cast housing of the connection unit.



Before and while the device is connected, the following must be observed:

1. Ensure that the mains supply provides the correct voltage and is suitable for the current required.
2. Ensure that suitable circuit breakers with the specified nominal current range are installed between the voltage source and the inverter.
3. Connect the mains voltage directly to the terminals **L_1-L_2/N-L3 and the earth** (according to the device).
4. To connect the motor, three flexible wires **U-V-W** should be used when mounting the motor.
5. For wall-mounting a 4-conductor shielded motor cable (recommended) to the terminals **U-V-W** and **earth** should be used. In this case the cable shielding should be connected to a large area of the metallic screw connector.

NOTE: when using specific **wiring sleeves**, the maximum connection cross-section can be reduced.

Screwdriver: Use a 5.5mm slot-head screwdriver to connect the power unit.

NOTE: If **synchronous machines** or **several motors** are connected in parallel to a device, the frequency inverter must be switched over to linear voltage/frequency characteristic curves, → P211 = 0 and P212 = 0.

NOTE: Only use copper cables with min. 75°C or 75°C/80°C or equivalent for connection. Higher temperature classes are permissible.

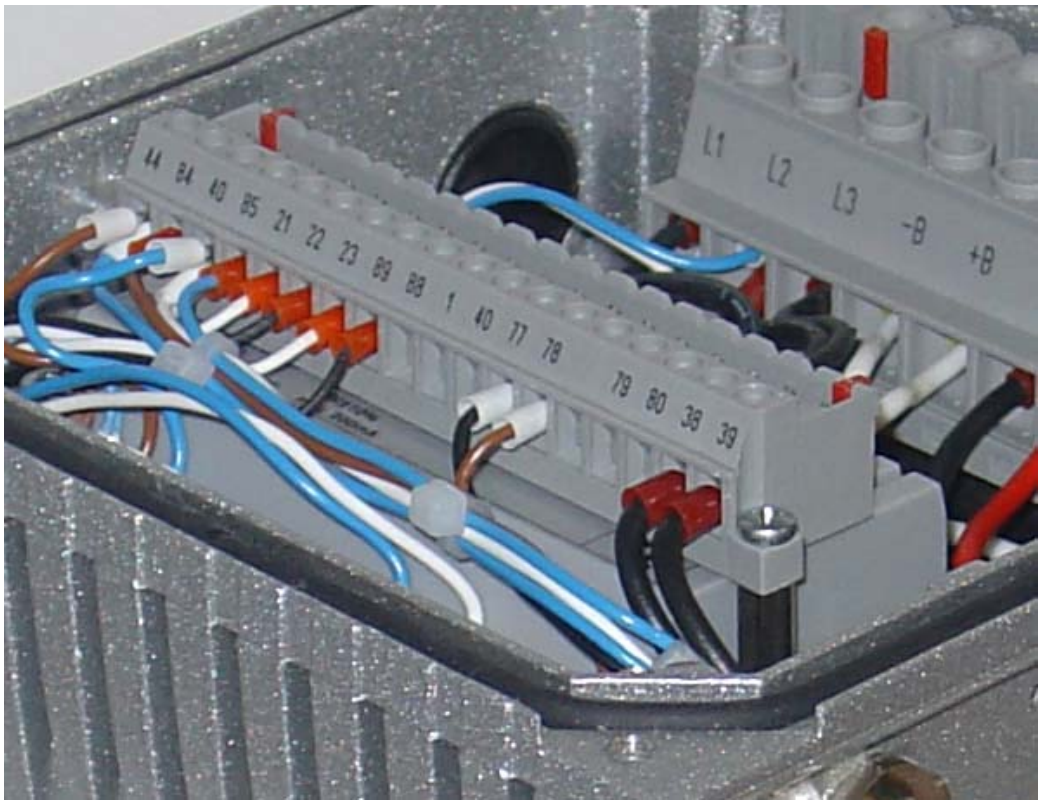
NOTE: The use of shielded cables is essential in order to maintain the specified radio interference suppression level.

ATTENTION: This device produces high frequency interference, which may make additional suppression measures necessary in **domestic environments.**

2.4 Electrical connection of SK 200E control unit

The control terminals are located on the inside of the frequency inverter connection unit. The connections differ according to the version (SK 205E, 215E, 225E, 235E).

Connection terminals:	Screw terminals, 3.5 mm slot-head screwdriver
Cable cross-section:	0.2 ... 2.5mm^2, AWG 24-14, rigid or flexible, without wire end sleeves
Tightening torque	0.5 ... 0.6Nm
Control cable:	Lay and shield separately from the mains/motor cables
Control voltages, External	18…30V, min. 200mA, the current load is increased according to the equipment. For the supply of the FI control unit and the connected options.



NOTE

GND is a common reference potential for analogue and digital inputs.

The labelling of the control terminal bar differs according to the SK 200E version.

Control terminal functions

LABELLING, FUNCTION

SH:	"Safe stop" function
AS:	Integrated AS interface
24V:	External 24V power supply
GND:	Reference potential for digital signals
DIN:	Digital input
DO:	Digital output
24V SH:	"Safe stop" input
GND SH:	"Safe stop" reference potential
SYS+/-:	System bus
MB+/-:	Electromagnetic brake control (105V, 180V, 205V)
TF+/-:	Motor PTC connection

CONNECTIONS AND FUNCTIONS FOR SK 200E VERSIONS

	FI type	SK 205E	SK 215E (SH)	SK 225E (AS1)	SK 235E (SH + AS1)
Pin	**Labelling**				
1	**44**	24V, external 24V FI supply*			
2	**44/84**	24V, external 24V FI supply		AS+, AS- Interface	
3	**40**	GND, reference potential for digital signals			
4	**40/85**	GND		AS- Interface	
5	**21**	DIN1 / digital input 1			
6	**22**	DIN2 / digital input 2			
7	**23**	DIN3, digital input 3			
8	**24/89**	DIN4, digital input 4	24V SH, “Safe stop”	DIN4, digital input 4	24V SH, “Safe stop”
9	**40/88**	GND	GND SH	GND	GND SH
10	**1**	DO 1, digital output 1			
11	**40**	GND			
12	**77**	SYS+, system bus			
13	**78**	SYS-, system bus			
14	**-**	---			
15	**79**	MB+, electromagnetic brake control			
16	**80**	MB-, electromagnetic brake control			
17	**38**	TF+, motor PTC connection			
18	**39**	TF-, motor PTC connection			

*With the use of the AS interface, terminal 44 provides an output voltage (24V, max. 60mA). In this case, no voltage sources may be connected to this terminal!

3 SK 200E displays and control

By combining different modules for display, control and parameterisation, the NORDAC SK 200E can be easily adapted to various requirements.

Alphanumeric display and control modules (Illustration below) can be used for simple commissioning. For more complex tasks, connection to a PC system and the use of Nord Con parameterisation software is available.

As supplied, without additional options, the diagnostic LEDs are externally visible. These signal the actual device status. 2 potentiometers and 8 DIP switches are provided in order to set the most important parameters. In this minimal configuration no other adapted parameters are stored in the plug-in EEPROM. The only exception is the data concerning operating hours, faults and fault circumstances. This data can be stored in the EEPROM.

SK 200E mounted on motor, top view

SK 200E not fitted, view from inside

.

Parameterisation and display options: SK CSX-3H and SK PAR-3H

4 Commissioning, SK 200E

The SK 200E inverter series can be commissioned in various ways:

a) For simple applications (e.g conveyor applications) by means of the DIP switches integrated into the SK 200E (inside) and potentiometers (externally accessible).

In this configuration the plug-in EEPROM is not required.

b) Through adaptation of parameters using software via the ParameterBox (SK CSX-3H or SK PAR-3H) or NordCon PC - supported software.

Here, the parameterised data is stored in the plug-in EEPROM. This must therefore always remain plugged in during operation.

ATTENTION

DANGER TO LIFE!

The frequency inverter is not equipped with a line main switch and is therefore always live when connected to the power supply. Live voltages may therefore be connected to a connected motor at standstill.

NOTE

For commissioning standard applications, a limited number of the frequency inverter inputs and outputs (physical and I/O bits) have predefined functions. These settings may need to be changed (Parameters (P420), (P434), (P480), (P481)).

4.1 Commissioning stages

4.1.1 Connection

After mounting the frequency inverter Adapter Unit on the motor or the wall mounting kit, the mains and motor cables must be connected to the relevant terminals (PE, L1, N (/L2, L3) und U, V, W).

In addition, a 24V DC control voltage supply to the frequency inverter is essential (connection to terminals 44/40).

In principle, the frequency inverter can be operated in this configuration.
(See Section 4.1.3)

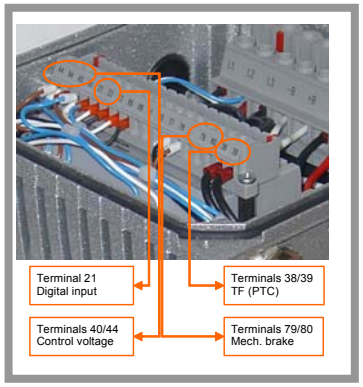


Illustration above: Control cable connections

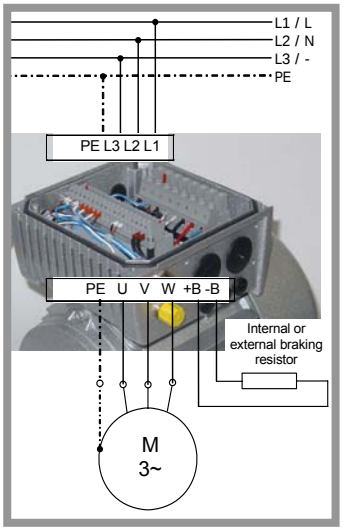


Illustration right: Mains / motor cable connections

NOTE

The necessary 24V control voltage can be implemented by in integrated SK CU4-…-24V) or an external (SK TU4-…-24V) optional mains unit or a comparable power source (min. 200mA).

4.1.2 Configuration

Changes to individual parameters are usually necessary for operation. (Exceptions: see Section 4.1.3)

Configuration can be carried out to a limited extent via the DIP switches. Configuration by means of software parameterisation is necessary for more extensive parameter changes.

NOTE

Mixing of DIP switch configuration and (software) parameterisation should be avoided.

4.1.2.1 Parameterisation

The use of a ParameterBox (SK CSX-3H / SK PAR) or NordCon software is necessary to change the parameters.

Parameter group	Parameter numbers	Functions	Remarks
Motor data	P201 … P207, (P208)	Data on motor rating plate	
	P220, Function 1	Measure stator resistance	Value is written to P208
	alternatively P200	Motor data list	Selection of a 4-pole standard motor from a list
	alternatively P220, Function 2	Motor identification	Complete measurement of a connected motor Prerequisite: motor at least 3 power levels less than the frequency inverter
Basic parameters	P102 … P105	Ramp times and frequency limits	
Control terminals	P400, P420	Analog and digital inputs	

NOTE

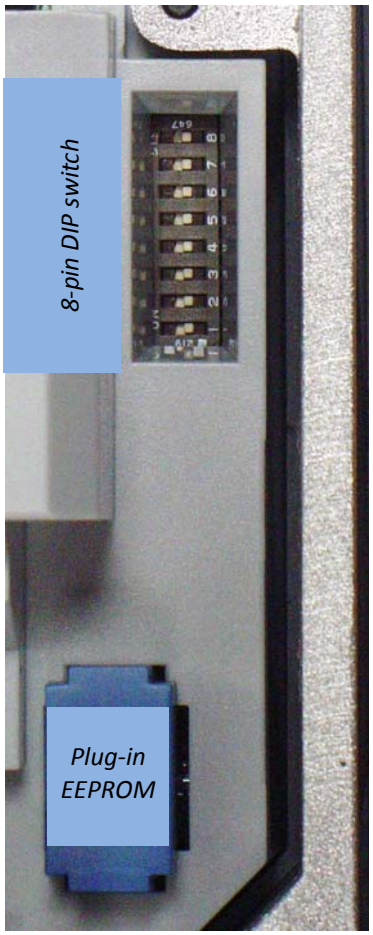
Prior to commissioning, it should be ensured that the frequency inverter is in its default setting (P523).

If configuration is carried out at a parameter level, the DIP switches must also be set to the "OFF" position.

4.1.2.2 DIP switch configuration

The DIP switches provide the possibility of carrying out commissioning without additional control units. Additional settings are made using the potentiometer on the top of the frequency inverter.

As supplied, all DIP switches are at the “Off” position, which corresponds to control via the digital inputs. The frequency setpoint value is adjusted via P1 and P2.



SK 200E, internal view

No. Bit	DIP switches			
8 2^7	**Int R_{Brake}** Internal brake resistor	off		Behaviour corresponding to P555, P556, P557
		on		Behaviour corresponding to the brake resistor used
7 2^6	**60Hz*** 50/60Hz-operation	off		Motor data corresponding to the rated power of the FI in kW relative to 50Hz, fmax = 50Hz
		on		Motor data corresponding to the rated power of the FI in hp relative to 60Hz, fmax = 60Hz
6 2^5	**V/F** Regulating process	off		VFC regulation corresponding to P211/P212
		on		V/f curve ((⇒ P211=0 und P212=0)
5/4 $2^{4/3}$	**I/O** Potentiometer function, digital inputs and AS interface	off	off	Corresponding to P420 [1-4] and P400 [1-2] or P480 [1-4] und P481 [1-4]
		off	on	Further details in the next table. (depends on the DIP3 "BUS")
		on	off	
		on	on	
3 2^2	**BUS** Source control word and setpoint value	off		Corresponding to P509 and P510 [1] [2]
		on		System bus (⇒ P509=3 and P510=3)
2/1 $2^{1/0}$	**ADR** System bus address/ baud rate	off	off	Corresponding to P514 and 515 [32, 250kBaud]
		off	on	Address 34, 250kBaud
		on	off	Address 36, 250kBaud
		on	on	Address 38, 250kBaud
	*) A changed setting is applied the next time the mains is switched on. Existing settings in parameters P201-P209 and P105 are overwritten!			

NOTE

FACTORY SETTING, AS DELIVERED!

*) As delivered, all DIP switches are in the “off” position. Control is by means of the digital control signals (P420 [01]-[04]) and the potentiometers P1 and P2 integrated in the FI (P400 [01]-[02]).

NOTE

For controlling the frequency inverter via In/Out bits (e.g.: AS-i, DIG In 1 - 4) typical values are preset in the relevant parameters (P480) and (P481). (Details: Section 5)

These settings apply to both control via AS-i bits and BUS I/O bits.

Details of DIP switches 5/4 and 3

Applies to devices SK 205E, SK 215E (without AS interface on board)

DIP			Functions as per the list of digital functions (P420)				Functions as per the list of analog functions (P400)	
5	4	3	Dig 1	Dig 2	Dig 3	Dig 4**	Poti 1	Poti 2
off	off	off	(P420 [01])* {01} "Enable R"	(P420 [02])* {02} "Enable L"	(P420 [03])* {04} "Fixed freq. 1" =5Hz (P465[01])	(P420 [04])* {05} "Fixed freq. 2" =10Hz (P465[02])	(P400 [01])* {01} "F setpoint"	(P400 [02])* {15} "Ramp"
off	on	off	{01} "Enable R"	{02} "Enable L"	{26} "F setpoint"	{12} "Quit"	{05} "F max"	{04} "F min"
on	off	off	{45} "3-on"	{49} "3-off"	{47} "Freq. +"	{48} "Freq. -"	{05} "F max"	{15} "Ramp"
on	on	off	{50} "F Arr Bit0" =5Hz (P465[01])	{51} "F Arr Bit1" =10Hz (P465[02])	{52} "F Arr Bit2" =20Hz (P465[03])	{53} "F Arr Bit3" =35Hz (P465[04])	{05} "F max"	{15} "Ramp"
off	off	on	The functions of the digital inputs are inactive (control via system bus), however, the settings made in parameters (P420 [01 … 04]) result in the activation of the correspondingly parameterised input, for the functions designated with ..² in the function list (e.g.: {11}²= "Quick stop").				(P400 [01]) {01} "F setpoint"	(P400 [02]) {15} "Ramp"
			(P420 [01]) no function	(P420 [02]) no function	(P420 [03]) {04} "Fixed freq. 1" =5Hz (P465[01])	(P420 [04]) {05} "Fixed freq. 2" =10Hz (P465[02])		
off	on	on	{14} "Remote control"	"Encoder track A"	"Encoder track B"	{01} "Enable R"	{01} "F setpoint"	{05} "F max"
on	off	on	{14} "Remote control"	{01} "Enable R"	{10} "Block"	{66} "Release brake"	{01} "F setpoint"	{05} "F max"
on	on	on	{14} "Remote control"	{51} "F Arr Bit1" =10Hz (P465[02])	{52} "F Arr Bit2" =20Hz (P465[03])	{53} "F Arr Bit3" =35Hz (P465[04])	{05} "F max"	{15} "Ramp"

Explanation: (values underlined in brackets) = (relevant parameter / source of function), **e.g.: Parameter (P420[01])**
{curly brackets} = {Function} **e.g.: {01} „Enable Right“**
(See also BU0200) → Table behind parameter (P420), (P400) or (P434))

* Default setting
** only if available (Devices without function "Safe Stop")

Applies to devices SK 225E, SK 235E (without AS interface on board)

DIP			Functions as per the list of digital functions (P420)				Functions as per the list of digital outputs (P434)			
5	4	3	ASi In1	ASi In2	ASi In3	ASi In4	ASi Out1	ASi Out2	ASi Out3	ASi Out4
off	off	off	(P480 [01])* {01} "Enable R"	(P480 [02])* {02} "Enable L"	(P480 [03])* {04} "Fixed freq. 1" =5Hz (P465[01])	(P480 [04])* {12} "Quit"	(P481 [01])* {07} "Error"	(P481 [02])* {18} "Standby"	"DigIn1"	"DigIn2"
off	on	off	{04} "Fixed freq. 1" =5Hz (P465[01])	{05} "Fixed freq. 2" =10Hz (P465[02])	{06} "Fixed freq. 3" =20Hz (P465[03])	{07} "Fixed freq. 4" =35Hz (P465[04])	{07} "Error"	{18} "Standby"	"DigIn1"	"DigIn2"
on	off	off	{01} "Enable R"	{02} "Enable L"	{47} "Freq. +"	{48} "Freq. -"	{07} "Error"	{18} "Standby"	"DigIn1"	"DigIn2"
on	on	off	{51} "F Arr B1" =10Hz (P465[02])	{52} "F Arr B2" =20Hz (P465[03])	{53} "F Arr B3" =35Hz (P465[04])	{14} "Remote control"	{07} "Error"	{18} "Standby"	"DigIn1"	"DigIn2"
off	off	on	The functions of the digital inputs are inactive (control via system bus), however, the settings made in parameters (P480 [01 … 04]) result in the activation of the correspondingly parameterised bits, for the functions designated with ..² in the function list (e.g.: {11}²= "Quick stop").				(P481 [01]) {07} "Error"	(P481 [02]) {18} "Standby"	"DigIn1"	"DigIn2"
			(P480 [01]) no function	(P480 [02]) no function	(P480 [03]) {04} "Fixed freq. 1" =5Hz (P465[01])	(P480 [04]) {12} "Quit"				
off	on	on	{14} "Remote control"	{04} "Fixed freq. 1" =5Hz (P465[01])	{05} "Fixed freq. 2" =10Hz (P465[02])	{06} "Fixed freq. 3" =20Hz (P465[03])	{07} "Error"	{18} "Standby"	"DigIn1"	"DigIn2"
on	off	on	{14} "Remote control"	{01} "Enable R"	{47} "Freq. +"	{48} "Freq. -"	{07} "Error"	{18} "Standby"	"DigIn1"	"DigIn2"
on	on	on	{14} "Remote control"	{50} "F Arr B0" =5Hz (P465[01])	{51} "F Arr B1" =10Hz (P465[02])	{52} "F Arr B2" =20Hz (P465[03])	{07} "Error"	{18} "Standby"	"DigIn1"	"DigIn2"

Explanation: See table above
Note:
The functions of potentiometers P1 and P2 correspond to those of devices without an AS interface (see table above).
With DIP switches 5 and 4 in the OFF position (default setting), the digital inputs are also active. The functions then correspond to those of devices without an AS interface (table above). In all other DIP switch combinations the functions of the digital inputs are deactivated.

ASi OUT1 and ASi OUT2 loop the signal level (High / Low) of digital inputs 1 and 2.

Details of potentiometers P1 and P2

The setpoint can be adjusted to a fixed value with the integrated potentiometer P1. Adjustment of the start-up and braking ramps can be made via potentiometer P2.

Potentiometer					
P1 (continuous)			**P2** (stepped)		
0%	P102/103	P105	-	-	-
10%	0.2s	10Hz	1	P102/103	P104
20%	0.3s	20Hz	2	0.2s	2Hz
30%	0.5s	30Hz	3	0.3s	5Hz
40%	0.7s	40Hz	4	0.5s	10Hz
50%	1.0s	50Hz	5	0.7s	15Hz
60%	2.0s	60Hz	6	1.0s	20Hz
70%	3.0s	70Hz	7	2.0s	25Hz
80%	5.0s	80Hz	8	3.0s	30Hz
90%	7.0s	90Hz	9	5.0s	35Hz
100%	10.0s	100Hz	10	7.0s	40Hz

The function of P1 and P2 depends on DIP 4/5. The meaning changes according to the setting.

As standard, P1 sets the setpoint value of 0-100% and P2 sets the ramp from 0.2-7sec.

4.1.3 Commissioning examples

4.1.3.1 Test operation

A SK 200E series frequency inverter which is to be used to control a 4-pole motor of the same power can be operated without any aids to testing purposes.

The only condition for this is the correct connection of the mains and motor cables and the supply of a 24V DC control voltage to the inverter (See Section 4.1.1).

The PTC input must be bypassed, if a motor with PTC is not available.

Configuration

For test operation the DIP switches 1 to 5 of the frequency inverter must be set to the "**OFF**" position and the digital input DIN1 (terminal 21) must be hard-wired to the 24V control voltage.

Control

Enabling is carried out as soon as the inverter's own setpoint potentiometer (Potentiometer P1, Section) is moved from the 0% position.

The setpoint can be adjusted to the requirements by further continuous adjustment of the potentiometer.

Resetting the setpoint to 0% sets the frequency inverter into "Standby" status.

Stepped adjustment of the ramp times within defined limits is also possible with the aid of potentiometer P2.

NOTE

This setting method is not suitable for the implementation of a so-called "automatic start with mains".

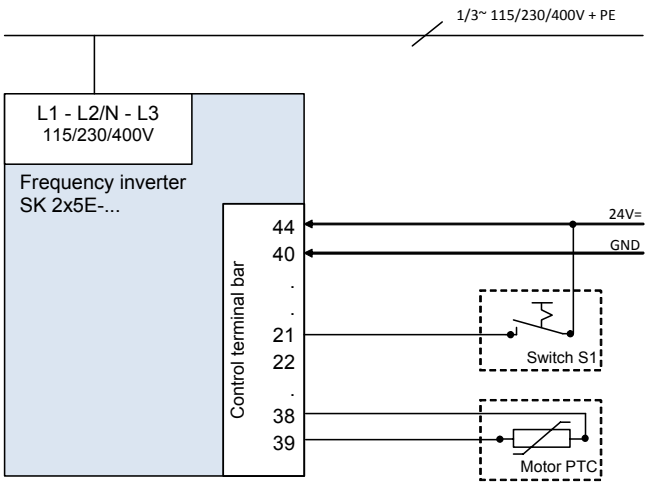
In order to use this function, it is essential that parameter (P428) "Automatic Start" is set to the function "ON". Adjustment of parameters is possible with the aid of a ParameterBox (SK xxx-3H) or with the NordCon software (Windows PC and adapter cable required).

4.1.3.2 Normal operation

Minimal configuration without options

The simplest version of normal operation is implemented by the integration of a switch to enable the controller instead of the hard wiring of the digital input 1 to 24V.

Parameter (P428) must be changed if an automatic startup with "Mains On" is required.



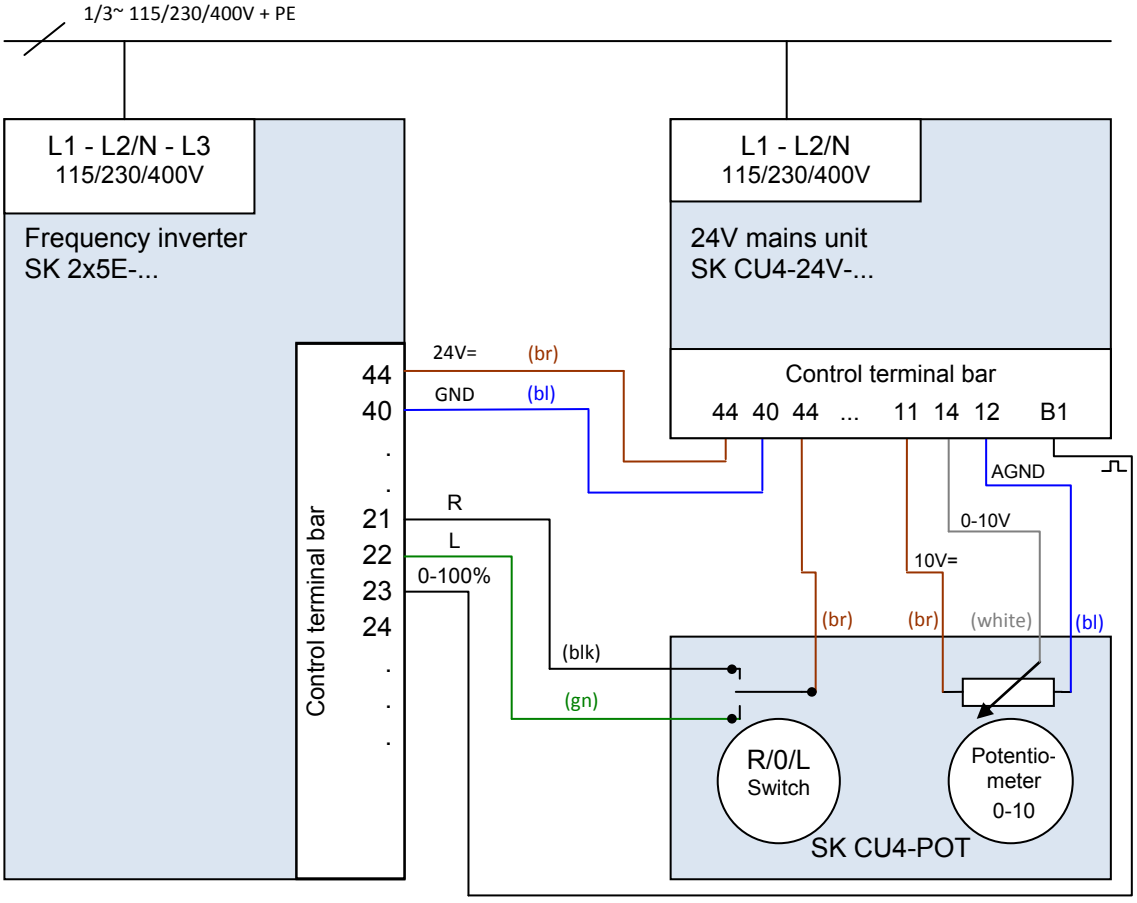
Function	Setting
Setpoint	Integrated potentiometer P1
Frequency ramp	Integrated potentiometer P2
Controller enable	External switch S1

Minimal configuration with options

In order to implement completely autonomous operation (i.e. independent of control cables etc.) a Potentiometer Unit (SK CU4-POT) is required. In combination with an integrated mains unit (SK CU4-…-24V) a solution can be implemented with only one mains cable (1~ / 3~ according to the version), and a suitable speed and direction control can be ensured (See connection example below).

This configuration method also provides the possibility of setting the frequency inverter to start automatically with "Mains On", by changing parameter (P428).

Connection plan and parameterisation of SK CU4-POT, example



DIP switch settings: DIP3 = off, DIP4 = on, DIP5 = off

or

recommended parameter setting, DIP1-8 = off: P400 [07] = 1 P420 [02] = 2
P420 [01] = 1 P420 [03] = 26

NOTE

An 8-Bit A/D converter is integrated into mains units SK TU4-…-24V and SK CU4-…-24V. This makes it possible to connect a potentiometer or other analog setpoint source to the mains unit and to transfer this to the digital input of the frequency inverter via a corresponding pulse signal.

4.2 ATEX Zone 22 for SK 2x5E

General information

With appropriate modification, the NORDAC SK 2x5E frequency inverter can be used in explosion hazard areas. For this it is important that all the safety information in the operating instructions is strictly complied with for the prevention of personal injury and material damage. This is essential to prevent injury and damage.

Qualified personnel

Qualified personnel must be used to carry out work involving the transport, assembly, installation, commissioning and maintenance. Qualified personnel are persons who due to their training, experience and instruction, and their knowledge of the relevant standards, accident prevention regulations and operating conditions are authorised to carry out the necessary activities for starting up the frequency inverter. This also includes knowledge of first aid measures and the local emergency services.

ATTENTION

All work must only be carried out with the power to the system switched off.

If the frequency inverter is connected to a motor and a gear unit, the EX labelling of the motor and the gear unit must also be observed.

Safety information

The increased danger in areas with inflammable dust demands the strict observation of the general safety and commissioning information. The drive unit must comply with the specifications in ***Planning Guideline No. 6052101***. Explosive concentrations of dust may cause explosions if ignited by hot or sparking objects. Such explosions may cause serious or fatal injuries to persons or severe material damage.

It is essential that the person responsible for the use of motors and frequency inverters in explosion hazard areas is trained in their correct use.

ATTENTION

Before opening the frequency inverter for the connection of electric cables or other work, the mains voltage must always be switched off and secured against switching on again!

Temperatures may occur within the frequency inverter and the motor, which are higher than the maximum permissible surface temperature of the housing. The frequency inverter may therefore not be opened or removed from the motor in an atmosphere of explosive dust!

Impermissibly heavy dust deposits must not be permitted, as these impair the cooling of the frequency inverter!

All cable glands which are not used, must be closed with blind screw plugs which are approved for explosion hazard areas.

Only the original seals may be used.

The protective film covering the diagnostic LEDs in TU4 modules must not be damaged.

It must be ensured that the plastic housing cover cannot be electrostatically charged by streams of particles caused by the fan.

Repairs may only be carried out by Getriebebau NORD.

4.2.1 Modified SK 2x5E for compliance with Category 3D

For the operation of an SK 2x5E in ATEX Zone 22 only a modified frequency inverter is permissible. This adaptation is only made at the NORD factory. In order to use the frequency inverter for ATEX Zone 22, the standard cable gland plugs must be replaced by ATEX-approved brass plugs. Also, in addition to modified seals, the clear plastic diagnostic plugs are replaced by aluminium/glass versions. The housing cover is also coated with a UV-resistant paint.

Getriebebau NORD GmbH & Co. KG
D-22941 Bargteheide / Germany
Rudolf-Diesel-Str. 1
Y: 2010
www.nord.com
II 3D Ex tD A22 IP55 T125 °C X*
Nmax: 3000 rpm
Fmax: 100Hz
* see manual
Warnung - nicht unter Spannung öffnen
Attention - do not open while energized

II 3D Ex tD A22 IP55 T125 °C X

Categorisation:

- Protection with "housing"
- Procedure "A" Zone "22" Category 3D
- Protection class IP55 / IP66 (according to the device)
- Maximum surface temperature 125°C
- Ambient temperature -20°C to +40°C

Series SK 2x5E frequency inverters and the associated options are only designed for a degree of mechanical hazard corresponding to a low impact energy of 4J.

The frequency inverter must not be exposed to direct sunlight.

The necessary adaptations are contained in the ATEX outdoor installation kits.

Device	Kit designation	Part Number
SK 200E SI … III	SK 200E-ATEX-BGI	275274200
SK TU4-xxx	SK 200E-ATEX-TU4	275274206

4.2.2 Options for ATEX Zone 22 3D

In order to ensure an ATEX-compliant NORDAC SK 2x5E frequency inverter, the approval of optional modules for explosion hazard areas must be observed. The following lists the various options with regard to their approval for use in ATEX Zone 22 3D.

4.2.2.1 Technology Units for ATEX Zone 22 3D

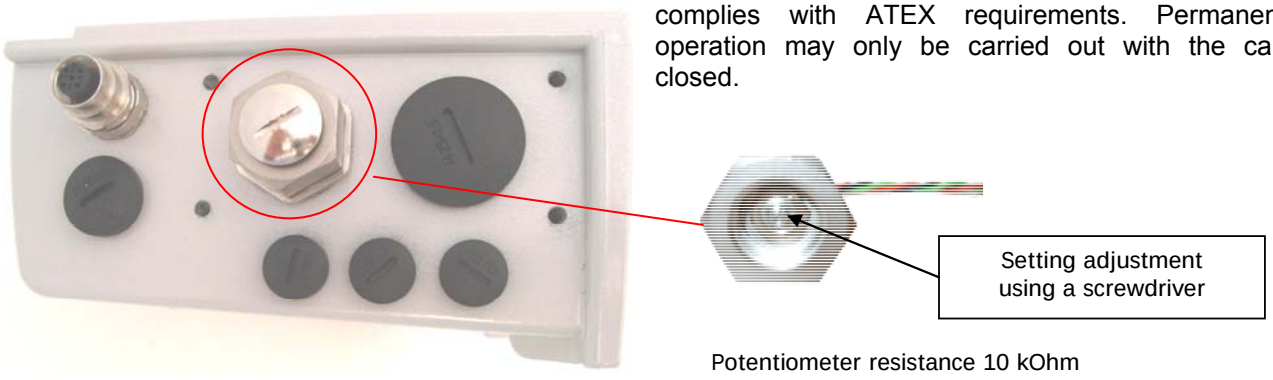
Name	Part Number	Approved for ATEX Zone 22 3D	Not approved for ATEX Zone 22 3D
SK TI4-TU-BUS(-C)	275280000 / (275280500)	x	
SK TI4-TU-NET(-C)	275280100 / (275280600)	x	
SK TU4-PBR(-C)	275281100 / (275281150)	x	
SK TU4-CAO(-C)	275281101 / (275281151)	x	
SK TU4-DEV(-C)	275281102 / (275281152)	x	
SK TU4-IOE(-C)	275281106 / (275281156)	x	
SK TU4-24V-123-B(-C)	275281108 / (275281158)	x	
SK TU4-24V-140-B(-C)	275281109 / (275281159)	x	

Name	Part Number	Approved for ATEX Zone 22 3D	Not approved for ATEX Zone 22 3D
SK TU4-POT-123-B(-C)	275281110 / (275281160)		x
SK TU4-POT-140-B(-C)	275281111 / (275281161)		x
SK TU4-PBR-M12(-C)	275281200 / (275281250)		x
SK TU4-CAO-M12(-C)	275281201 / (275281251)		x
SK TU4-DEV-M12(-C)	275281202 / (275281252)		x
SK TU4-IOE-M12(-C)	275281206 / (275281206)		x

4.2.2.2 Customer Units for ATEX Zone 22 3D

Name	Part Number	Approved for ATEX Zone 22 3D	Not approved for ATEX Zone 22 3D
SK CU4-PBR	275271000	x	
SK CU4-CAO	275271001	x	
SK CU4-DEV	275271002	x	
SK CU4-IOE	275271006	x	
SK CU4-POT	275271207		x
SK CU4-24V-123-B	275271108	x	
SK CU4-24V-140-B	275271109	x	
SK ATX-POT	275142000	x	

The SK 2x5E for Category 3D can be equipped with an ATEX-compliant potentiometer, which can be used to adjust a setpoint (e.g. speed) on the device. The potentiometer is used with an M20-M25 extension in one of the M25 cable glands. The selected setpoint can be adjusted with a screwdriver. Due to the removable screw closing cap, this component complies with ATEX requirements. Permanent operation may only be carried out with the cap closed.



Potentiometer resistance 10 kOhm

Wire colours on the potentiometer	Name	Terminal CU4-24V	Terminal CU4-IOE
Red	+10V reference	[11]	[11]
Black	AGND / 0V	[12]	[12]
Green	Analog input	[14]	[14] / [16]

NOTE: For the use of a potentiometer with frequency inverter SK 2x5E a Customer Unit CU4-24V-xxx-B or CU4-IOE is necessary.

4.2.2.3 Hand-held Technology Units for ATEX Zone 22 3D

All hand-held technology units are not approved for continuous use in the ATEX Zone 22 3D. The may therefore only be used during commissioning or for maintenance purposes, if it is ensured that no explosive dust atmosphere exists.

Name	Part Number	Approved for ATEX Zone 22 3D	Not approved for ATEX Zone 22 3D
SK CSX-3H	275281013		x
SK PAR-3H	275281014		x

ATTENTION

The diagnostic opening of the basic unit for the connection of a hand-held technology unit or a PC must not be opened in an atmosphere containing explosive dust.

4.2.2.4 Braking resistors

External braking resistors of type SK BRE4-x-xxx-xxx are not permitted for use in ATEX Zone 22 3D.

Name	Part Number	Approved for ATEX Zone 22 3D	Not approved for ATEX Zone 22 3D
SK BRI4-1-100-100	275272005	x	
SK BRI4-1-200-100	275272008	x	
SK BRI4-1-400-100	275272012	x	
SK BRI4-2-100-200	275272105	x	
SK BRI4-2-200-200	275272108	x	
SK BRE4-1-100-100	275273005		x
SK BRE4-1-200-100	275273008		x
SK BRE4-1-400-100	275273012		x
SK BRE4-2-100-200	275273105		x
SK BRE4-2-200-200	275273108		x

ATTENTION

If an internal braking resistor of type SK BRI4-x-xxx-xxx is used, the power limitation for this must be activated under all circumstances. This is usually done by setting DIP switch 8 to "ON". Alternatively, parameters (P555), (P556) and (P557) can be parameterised with the appropriate values. Only the resistors assigned to the relevant inverter type may be used.

4.2.2.5 Other options

M12 sockets and plugs for installation in the terminal box of the basic device or in technology units may only be used of they are approved for use in ATEX Zone 22 3D.

Name	Part Number	Approved for ATEX Zone 22 3D	Not approved for ATEX Zone 22 3D
SK TIE4-WMK-1	275274000	x	
SK TIE4-WMK-2	275274001	x	
SK TIE4-WMK-TU	275274002	x	
SK TIE4-HAN10E	275274100		x
SK TIE4-HANQ5	275274110		x
SK TIE4-SWITCH	275274610		x
SK TIE4-M12-M16	275274510	x	
SK TIE4-M12-PBR	275274500		x
SK TIE4-M12-CAO	275274501		x
SK TIE4-M12-AS1	275274502		x
SK TIE4-M12-INI	275274503		x
SK TIE4-M12-IOL*	275274504		x
SK TIE4-M12-SYSM	275274505		x
SK TIE4-M12-SYSS	275274506		x
SK TIE4-M12-POW	275274507		x

* to be discontinued

4.2.3 Maximum output voltage and torque reduction

As the maximum output voltage depends on the pulse frequency to be set, in some cases the torque which is stated in Planning Guideline 605 2101 must be reduced for values above the rated pulse frequency of 6 kHz.

For F_{puls} > 6kHz: $T_{reduction}[\%] = 1\% * (F_{puls} – 6kHz)$

Therefore the maximum torque must be reduced by 1% for each kHz pulse frequency above 6kHz. The torque limitation must be taken into account on reaching the break frequency. The same applies for the degree of modulation (P218). With the factory setting of 100%, in the field reduction range a torque reduction of must be taken into account:

For P218 > 100%: $T_{reduction}[\%] = 1\% * (105 – P218)$

Above a value of 105%, no reduction needs to be taken into account. However, with values above 105% no increase in torque above that of the Planning Guideline will be achieved. Under certain circumstances, degrees of modulation > 100% may lead to oscillations and motor vibration due to increased harmonics.

ATTENTION

At pulse frequencies above 6 kHz (400/500V devices) or 8 kHz (230V) devices, the reduction in power must be taken into account for the design of the drive unit.

If parameter (P218) is set to < 105%, the derating of the degree of modulation must be taken into account in the field reduction range.

4.2.4 Commissioning information

For Zone 22 the cable glands must at least comply with protection class IP 55. Unused openings must be closed with blank screw caps suitable for ATEX Zone 22 3D (minimum protection class IP 55).

The motors are protected against overheating by means of the frequency inverter. This is carried out by the evaluation of the motor PTC by the frequency inverter. In order to ensure this function, the PTC must be connected to the intended input (Terminal 38/39 control terminal plug connector). In addition, care must be taken that a NORD motor from the motor list (P200) is set. If a standard 4-pole NORD motor or a motor from a different manufacturer is not used, the data for the motor parameters ((P201) to (P208)) must be adjusted to those on the motor rating plate. In addition, the frequency inverter must be parameterised so that the motor can be operated with a maximum speed of 3000 $^{1}/_{min}$. For a four-pole motor, the "maximum frequency" must be set to a value which is smaller or equal to 100Hz ((P105) ≤ 100). Here the maximum permissible output speed of the gear unit must be observed. In addition, the monitoring "I²t-Motor" (Parameter (P535) / (P533)) must be switched on and the pulse frequency set to between 4 kHz and 6 kHz.

Overview of the necessary parameter settings:

Parameter	Setting value	Factory setting	Description
P105 Maximum frequency	≤ 100 Hz	[50]	This value relates to a 4-pole motor. On principle, the value must only be so large that a motor speed of 3000 rpm is not exceeded.
P200 motor list	Select the appropriate motor power	[0]	If a 4-pole NORD motor is used, the preset motor data can be called up.
P201 – P208 Motor data	Data according to rating plate	[xxx]	If a 4-pole NORD motor is not used, the motor data on the rating plate must be entered here.
P218 Degree of modulation	≥ 100%	[100]	Determines the maximum possible output voltage
P504 Pulse frequency	4kHz … 6kHz	[6]	For pulse frequencies above 6kHz a reduction of the maximum torque is necessary.
P533 Factor I²t-Motor	< 100%	[100]	A reduction in torque can be taken into account with values less than 100 in the I²t monitoring.
P535 I²t motor	According to motor and ventilation	[0]	The I²t- monitoring of the motor must be switched on. The set values depend on the type of ventilation and the motor used. See ***Planning Guideline No.: 605 2101***

4.2.5 EC declaration of conformity

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DRIVESYSTEMS

EG-Konformitätserklärung

Im Sinne der EG-Richtlinie 94/9/EG Anhang VIII

Hiermit erklären wir von Getriebebau Nord GmbH & Co. KG,
dass die dezentralen Frequenzumrichter der Produktreihe

- SK 205E-xxx, SK 215E-xxx, SK 225E-xxx, SK 235E-xxx -

und die Optionen

- SK TU4-PBR-x, SK TU4-CAO-x, SK TU4-DEV-x,
SK TU4-IOE-x, SK TU4-24V-xxx, SK TI4-TU-xxx -

in ihrer optionalen ATEX-Ausführung folgender Bestimmung entsprechen:

Richtlinie für Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen	**94/9/EG**
Gerätekennzeichnung der IP55 Ausführung: (nichtleitender Staub)	**Ex II 3D Ex tD A22 IP55 T125°C X**
Gerätekennzeichnung der IP66 Ausführung: (leitender Staub)	**Ex II 3D Ex tD A22 IP66 T125°C X**

Angewandte harmonisierte Normen:

EN 61241-0:2007	Elektrische Betriebsmittel zur Verwendung in Bereichen mit brennbaren Staub – Teil 0: Allgemeine Anforderungen
EN 61241-1:2005	Elektrische Betriebsmittel zur Verwendung in Bereichen mit brennbaren Staub – Teil 1: Schutz durch Gehäuse „tD“
EN 60529:2000	Schutzart durch Gehäuse (IP-Code)

Die erste Kennzeichnung erfolgte in 10.

Bargteheide, den 25.01.2010

U. Küchenmeister
Geschäftsleitung

i.V. F. Wiedemann
Bereichsleiter Frequenzumrichter

5 Parameterisation of frequency inverter SK 200E

The frequency inverter, field bus and I/O -extension modules each have their own logic systems. These can be adapted to customers' requirements by means of changeable parameters. The basic functions of the particular modules are factory-set, so that the units have basic functionalities on delivery. Limited adaptations of individual functions of the relevant devices can be implemented via DIP switches. For all further adjustments, access to the parameters of the relevant device with the aid of a ParameterBox (SK PAR-3H, SK CSX-3H) or NordCon software is essential. **It should be noted that the hardware configuration (DIP switches) has priority over configuration via software (parameterisation).**

The following is a list of the most common parameters and functions. A complete list of the parameters and a detailed description of them can be found in the main document (BU0200).

Every frequency inverter is factory-set for a motor of the same power.

Parameter menu groups

The individual parameters are combined in various parameter sets. The first digit of the parameter number indicates the assignment to a **menu group**:

Menu group	No.	Master function
Operating displays	**(P0--):**	For the selection of the physical units of the display value.
Basic parameters	**(P1--):**	Contain the basic inverter settings, e.g. switch on and switch off procedures and, along with the motor data, are sufficient for standard applications.
Motor data	**(P2--):**	Settings for the motor-specific data, important for ISD current control, and selection of characteristic curve during the setting of dynamic and static boost.
Control Parameters	**(P3--):**	Parameter for the adaptation of any incremental encoder used.
Control terminals	**(P4--):**	Analog input and output scaling, specification of digital input and relay output functions, as well as PI controller parameters.
Additional parameters	**(P5--):**	Functions dealing with e.g. the BUS interface, pulse frequency or error acknowledgement.
Positioning	**(P6--):**	Adjustment of the positioning function in SK 200E. For further details please refer to Manual **BU 0210**.
Information	**(P7--):**	Display of e.g. actual operating values, old error messages, equipment status reports or software version.
Array parameter	**-01** **...** **-xx**	Some parameters in these groups can be programmed and read in several levels (arrays). After the parameter is selected, the array level must also be selected.

NOTE: Parameter P523 can be used to load the factory settings for all parameters at any time. This can be helpful, e.g. during the commissioning of a frequency inverter whose parameters no longer correspond with the factory settings.

ATTENTION

All current parameter settings will be overwritten, if P523= 1 is set and confirmed with "OK".

To save the actual parameter settings, these can be transferred to the ParameterBox memory.

Parameter list - inverter functions (selection)

Parameter	Description	Factory setting	Settings / functions (selection)
P102 Start-up time	Start-up time (acceleration ramp) is the time corresponding to the linear frequency rise from 0Hz to the set maximum frequency (P105).	[2.00]	Note: Values < 0.1 must be avoided
P103 Braking time	The braking time (braking ramp) is the time corresponding to the linear frequency reduction from the set maximum frequency (P105) to 0Hz.	[2.00]	Note: Values < 0.1 must be avoided
P104 Minimum frequency	The minimum frequency is the frequency supplied by the FI as soon as it is enabled and no additional setpoint is set.	[0]	
P105 Maximum frequency	Is the frequency provided by the FI after it has been enabled and the maximum setpoint value is available.	[50]	
P200 motor list	If a 4-pole NORD motor is used, the preset motor data can be called up.	[0]	Select appropriate motor power
P201 – P208 Motor data	If a 4-pole NORD motor is not used, the motor data on the rating plate must be entered here.	[xxx]	Data according to rating plate
P220 Parameter identification	The motor data is automatically determined by the FI with this parameter.	[0]	01= only stator resistance 02= motor identification
P400 Setpoint input function	Definition of the functions of the various setpoint inputs <u>Input selection:</u> Poti P1 (P400, Array -01) Poti P2 (P400, Array -02) DIN 2 (P400, Array -06) DIN 3 (P400, Array -07)	[xxx]	00= No function 01= Setpoint frequency 15= Ramp time (only P1 / P2)
P420 Digital input functions	Definition of the functions of the various setpoint inputs <u>Input selection:</u> DIN 1(P420, Array -01) DIN 2 (P400, Array -02) DIN 3 (P400, Array -03) DIN 4 (P400, Array -04)	[xxx]	00= No function 01= Enable right 02= Enable left 04= Fixed frequency 05= Fixed frequency 26= Analog function (only DIN2/3)
P428 Automatic start	Inverter enable with "Mains On"	[0]	0= Off (enable with flank) 1= On (enable with level) **Note:** one digital input must be programmed and set to enable.
P465 Fixed frequency / Fixed frequency array	Definition of fixed frequency values <u>Selection:</u> Fixed frequency 1 (P465, Array -01) Fixed frequency 2 (P465, Array -02)	[xxx]	
P509 Control word source	Selection of the interface via which the FI is controlled.	[0]	00= Control terminals or keyboard 01= Only control terminals 03= System bus
P523 Factory setting	Frequency inverter is restored to the factory setting	[0]	00= No change 01= Load factory setting

Parameter list - inverter information (selection)

Parameter	Description	Settings / functions (selection)
P700 Current operating status	Display of current messages for the actual operating status of the frequency inverter such as errors, warnings or the cause of a switch-on block. Selection: Current error (P700, Array -01) Current warning (P700, Array -02) Reason for switch-on block (P700, Array -03)	Error group: 1 / 2 = Overtemperature of inverter / motor 3 / 4 = Overcurrent error 5 = Overvoltage error 16 = Motor phase monitoring 19…= Parameter identification error
P701 Last error	Displays the last 5 frequency inverter errors. Selection: Last error (P701, Array -01) Second to last error (P701, Array -02)	See P700
P707 Software version	Displays the firmware version / Inverter revision Selection: Software version (P707, Array -01) Revision (P707, Array -02)	
P708 Digital input status	Shows the switching status of the digital inputs.	Bit 0 = DIN 1 Bit 1 = DIN 2 …
P709 Analog input voltage	Displays the measured analog input value. Input selection: Poti P1 (P400, Array -01) Poti P2 (P400, Array -02) DIN 2 (P400, Array -06) DIN 3 (P400, Array -07)	
P719 Actual current	Displays the actual output current.	
P740 Process data Bus In	Displays the actual control word and the setpoints.	[-01] = STW (Source P509) [-02…-04] SW 1…3 (Source P510[-01] [-11…-13] SW 1…3 (Source P510[-02]
P749 DIP switch status	Displays the current DIP switch setting.	Bit 0 = DIP switch 1 Bit 1 = DIP switch 2 …

6 Operating status messages and LED displays

The frequency inverter generates operating status messages. These messages (warnings, errors, switching statuses, measurement data) can be displayed with parameterisation tools (e.g. ParameterBox) (Parameter group P7xx).

To a limited extent, the messages are also indicated via the diagnostic and status LEDs.

Error messages

Errors cause the frequency inverters to switch off, in order to prevent a device fault.

The following options are available to reset a fault (acknowledge):

1. Switching the mains off and on again,
2. By an appropriately programmed digital input (P420 = Function 12),
3. By switching of the “enable” on the frequency inverter to Low (if no digital input is programmed for acknowledgement),
4. By Bus acknowledgement or
5. by P506, the automatic error acknowledgement.

An error message can only be acknowledged if its direct cause is no longer present.

Diagnostic LEDs

LED			Signal	
Name	**Colour**	**Description**	**Status**	**Meaning**
DOUT 1	yellow	Digital output 1	on	High signal applied
DIN 1	yellow	Digital input 1	on	High signal applied
DIN 2	yellow	Digital input 2	on	High signal applied
DIN 3	yellow	Digital input 3	on	High signal applied
DIN 4	yellow	Digital input 4	on	High signal applied
TEMP	yellow	Motor PTC	on	Motor overtemperature
Chop	yellow	Brake chopper	on	Brake chopper active, brightness → degree of load
Brake	yellow	Mech. brake	on	Mech. Brake released
BUS-S	green	System bus status	off	No process data communication
			Flashing (4 Hz)	"BUS Warning"
			on	Process data communication active ⇒ Reception of at least 1 telegram / s ⇒ SDO transfer is not indicated
BUS-E	green	System bus error	off	No error
			Flashing (4 Hz)	Monitoring error P120 or P513 ⇒ E10.0 / E10.9
			Flashing (1 Hz)	Error in an external system bus module ⇒ Bus module → Timeout on the external BUS (E10.2) ⇒System bus module has a module error (E10.3)
			on	System bus in state “BUS off”

Status LEDs

LED			Signal		
Name	**Colour**	**Description**	**Status**		**Meaning**
DS	dual red/green	Frequency inverter status	off		FI not on standby, ⇒ no mains and control voltage
			green on		FI on standby
			green flashing	0.5 Hz	FI is ready for switch-on
				2 Hz	FI is in switch-on block
			red/green alternating	0.5 Hz	Warning
				1 … 25Hz	Degree of overload of switched-on FI
			green on + red flashing		FI not on standby, ⇒ Control voltage available but no mains voltage
			red flashing		Error, flashing frequency → Error number
AS-I	dual red/green	AS-i status	off		No voltage to the AS-i module (PWR)
			green		Normal operation
			red		No exchange of data ⇒ Slave Address = 0 / Slave not in LPS / Slave with incorrect IO/ID / Master in STOP mode / Reset active
			alternately flashing red / green		Peripheral error

7 Technical Data Frequency Inverter

Function		Specification		
Output frequency		0.0 … 400.0Hz		
Pulse frequency		3.0 … 16.0kHz, standard setting = 6kHz Power reduction > 8kHz for 115/230V device, >6kHz for 400V device.		
Typical overload capacity		150% for 60s, 200% for 3.5s		
Protective measures against		Over-heating of the frequency inverter, overvoltage and undervoltage	Short-circuit, earthing fault, overload, idling	
Regulation and control		Sensorless current vector control (ISD), linear V/f characteristic curve, automatic flux adaptation (energy-saving function)		
Motor temperature monitoring		I^2t motor, PTC / Bimetal switch		
Digital input		4x, Low 0-5V, High 14-30V, R_i = 9.5kΩ, C_i = 10nF, cycle time = 4ms		
Electrical isolation		Control terminals		
Control outputs	digital output:	18-30V DC (according to VI 24V), max. 200mA, max. 100kΩ load		
	Brake rectifier:	max. 0.5A choke voltage, voltage according to mains		
Interfaces		Standard: RS 485 (USS) RS 232 (Single Slave) System bus	Option: Profibus CANopen DeviceNet AS Interface	
Efficiency of frequency inverter		approx. 95% according to size		
Storage and transport temperature		-25°C … +60/70°C		
Operating / ambient temperature		-25°C … +50°C, according to operating mode (Details: see BU0200) ATEX: -20…+40°C (Details: Section 4.2)		
Long-term storage		Connect the FI and the 24V modules to the mains voltage for 60 minutes at the latest after one year. Connect the FI and all other modules to be supplied with 24V to the 24V control voltage for 60 minutes at the latest after one year. Maintain this cycle throughout the storage period.		
Protection class		IP55, optional IP66		
Max. mounting altitude above sea level		Up to 1000m: No power reduction 1000...4000m: 1%/ 100m power reduction (up to 2000m overvoltage cat. 3) 2000...4000m: Only overvoltage category 2 is maintained, external overvoltage protection at the mains input is necessary		
Waiting period between two power-up cycles		60 sec for all devices in normal operating cycle		
Connection terminals	Mains/motor/brake resistance	$4mm^2$ flexible with wiring sleeves, $6mm^2$ with rigid cable		Terminal screw tightening torque 1.2...1.5Nm
	Control unit /System bus	$2.5mm^2$, with$1.5mm^2$ wiring sleeves		
	RS485 / RS232	1x RJ12 (6-pin)		
External 24V supply voltage		18…30V DC, at least 200...800mA according to load		

8 Maintenance and servicing information

In normal use, NORDAC SK 200E frequency inverters are maintenance free. Please note the "General Data".

If the frequency converter is being used in a dusty environment, then the cooling-vane surfaces should be regularly cleaned with compressed air. If air intake filters have been built into the control cabinet, then these should also be regularly cleaned or replaced.

If you contact our technical support, please have the precise device type (rating plate/display), accessories and/or options, the software version used (P707) and the series number (rating plate) at hand.

Repairs

The device must be sent to the following address if it needs repairing:

NORD Electronic DRIVESYSTEMS GmbH

Tjüchkampstraße 37

26605 Aurich, Germany

For queries about repairs, please contact:

Getriebebau NORD GmbH & Co. KG

Telephone: 04532 / 401-515

Fax: 04532 / 401-555

If a frequency inverter is sent in for repair, no liability can be accepted for any added components, e.g. such as mains cables, potentiometer, external displays, etc.!

Please remove all non-original parts from the frequency inverter.

NOTE

If possible, the reason for returning the component/device should be stated. If necessary, at least one contact for queries should be stated.

This is important in order to keep repair times as short and efficient as possible.

On request you can also obtain a suitable return goods voucher from Getriebebau NORD.

Internet information

You can find the comprehensive manuals in German and in English on our Internet site.

www.nord.com

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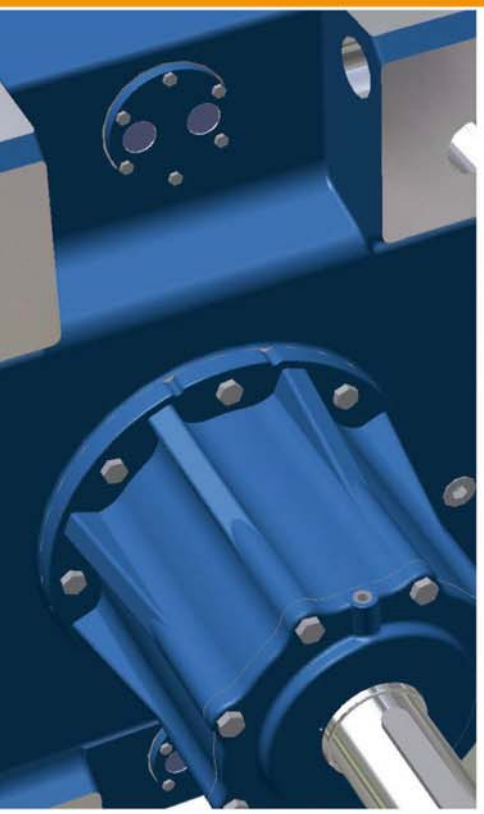

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